

PATENT SPECIFICATION (11)

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(54) TV RECEIVER EQUIPPED FOR SIMULTANEOUSLY SHOWING
 SEVERAL PROGRAMMES

(71) We, ITT INDUSTRIES INC., a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 320 Park Avenue, New York 22, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Televisions receivers have been proposed which, in addition to a main screen, have a second screen of substantially smaller picture area than the main screen, so that the viewer can watch, in addition to a programme shown on the main screen, a further programme on the smaller secondary screen.

Besides the investment required for the second picture tube, such a receiver, as a rule, requires two complete receiving sections for the different programmes, i.e. the tuner, the i.f. amplifier, the video stages and the deflection circuits must be duplicated. This involves considerable additional expenditure.

Another method for showing two different television programmes has been demonstrated at exhibitions, see the German technical journal "radio mentor electronic", March 1974, p. 95. In this journal, there is described an arrangement in which one of the pictures to be shown on a tv receiver screen is received and displayed in the usual way. By means of a second receiver, whose picture screen is scanned by a television camera, a further station is received. The output signals from the television camera are then fed to the first receiver and shown under the control of an electronic switch, the arrangement being such that the second picture can be shown in place of a part of the first picture. A similar method is also disclosed in German published patent application (DOS) 2,239,593. These solutions all involve a considerable investment and are unsuitable for use in domestic receivers.

siderable investment and are unsuitable for use in domestic receivers.

The present invention provides an arrangement which enables a television receiver to show at least two programmes in a more simple way than has been proposed hitherto.

According to the present invention there is provided a broadcast television receiver in which a first broadcast programme and at least one further broadcast programme receivable on different frequencies of a broadcast television network can be shown simultaneously on the same screen of a picture reproduction device, including means in the receiver for receiving said programmes sequentially, and means for reproducing on reduced scale the picture corresponding to the or a further programme on a portion of the screen of the said device on which the picture corresponding to the first programme is being reproduced and so as to replace that part of the picture of the first programme in the said portion.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 schematically shows diagrammatically a front perspective view of a television receiver, and

Fig. 2 shows a block schematic circuit diagram of a television receiver.

Fig. 1 shows a picture which is obtainable on a screen 2 of a television receiver 1, and which is constituted by a first programme (I) covering the major part of the screen 2, for example by an association football match, while a part 2a of the screen shows a further programme II. In the case of a picture transmitted according to the 625-line television standard, the number of lines of the second picture 2a may consist of, e.g. 45 lines, with the picture diagonals having a length of about 10 cm. Thus the number of lines and the number of picture elements of the image sector 2a is considerably re-

duced in the case of the reproduction thereon of the further programme II compared with its reproduction as the main programme on the screen 2. As a rule, the image sector 2a shows the whole picture of the programme II on a reduced scale.

The block diagram of an embodiment of a receiver according to the invention, shown in Fig. 2, illustrates the signal path common to both programmes, extending from the antenna via an r.f. tuner with an i.f. output 3, an i.f. amplifier and demodulator 4, and a video amplifier 5 to a picture tube 6, with a horizontal deflection stage 7 and a vertical deflection stage 8 being associated with this common signal path in the usual way. The television receiver 1 also contains an audio amplifier 9 and a loudspeaker 10.

This common signal path is acted upon by a storing and switching stage 11, which is controlled on the one hand by the output of the i.f. amplifier 4 and on the other hand by the output of the horizontal deflecting stage 7. The stage 11 acts upon the tuner 3, the i.f. amplifier 4 and the video amplifier 5 in a way to be explained hereinafter.

It is assumed that the tuning means of the tuner 3, for example varactor diodes with associated potentiometers for the voltage adjustment of the diodes, have been set to the station for receiving the programme I and to the station for receiving the further programme II. In dependence upon the signal from the horizontal stage 7, the storing and switching stage 11 controls the tuner 3 in such a way that, during certain lines, it is switched from programme I to the further programme II. During these periods of time, the video amplifier 5, by the action of the switching device of the storing and switching stage 11, is connected to the storage device thereof by means not shown, so that the lines of the now received and processed further programme II are stored in the storage device. In addition to the switching of the tuner 3 to the further programme II, there is a corresponding switching of the gain of the i.f. amplifier 4.

The storage device transfers the information as stored therein under the control of pulses from deflecting unit 7 to the video stage as soon as the electron beam sweeping the screen reaches the area of the image sector 2a, the programme signals corresponding to the first programme I being blanked out at such times.

The storage device enables a reduction to be made in the size of the picture of the further programme II, and the time difference between the switching to the station of the further programme II and the reproduction of this information to be bridged. Reduction in size of the picture of the further programme II is accomplished by reading the formation out of the store at a higher

speed than that at which the information is written in.

It is of advantage to effect the switching of the tuner 3 to the further programme II a line at a time only, in order to disturb the reception of the programme I as little as possible.

Since the flow of programme I information to the picture tube 6 is interrupted during the time required for the switching to the further programme II, it is necessary, during this time, to offer a "substitute programme" to the picture tube 6. A signal which is suitable for this purpose, in the most simple case, is the medium brightness value, hence corresponding to the medium grey value, of a preceding line or lines. With regard to colour television receivers it is advisable to continue at least with the representation of the colour information, and, in the case of a colour television receiver operating on the PAL-system, the colour information to be represented again is that corresponding to the colour signal of the preceding line. In other words, the colour information which continues to be represented for filling the gap taken from the PAL-delay line contained in the receiver.

In the case of a colour television receiver, moreover, the programme I will be least disturbed whenever the brightness information of the preceding line is fed to the picture tube in addition to the aforementioned colour information, while the further programme II is being stored in the storage device.

With regard to the last-mentioned case it will be necessary to provide an additional storage device for storing the brightness information of the preceding line until the switching to the further programme II is carried out. This additional storage device may be of a relatively simple design if the bandwidth of the signal of the switched line is considerably reduced, for example, by a factor of 10. This can be carried out without difficulty because the picture element resolution of this line does not need to be very high since the line which is being represented again actually involves a "false" line.

As already mentioned, as a result of the fact that the further programme II is represented as a complete picture on a reduced scale, which is written at the normal raster resolution, the number of lines, as well as the number of picture elements per line, to be stored with respect to this information, can be reduced by the imaging scale. Good visibility of the programme contents can be obtained if provision is made for using about fifty lines with about fifty picture elements.

Preferably, the storage device for the further programme II, as contained in the storing and switching stage 11, is designed in

the way described hereinafter. The storage device has storage positions for the lines of the further programme II arranged line by line, with the number of storage line positions corresponding to the number of lines to be stored. Firstly, the first line of the further programme is stored in the first storage line by suitably switching the tuner. After the tuner has been switched back to the programme I, the first line of the stored further programme II is shifted into the next storage line, so that the first storage line again becomes free for the second line of the further programme II to be stored. This shifting of the individual stored lines of the further programme II in the individual storage lines is continued with the storage of subsequent lines until the first stored line has reached the last storage line. The storage device will now contain a complete picture of the further programme II. The line-by-line shifting is preferably carried out by way of parallel transfer, but can equally well be done serially.

Now the stored picture may be displayed on the screen of the picture tube by means of a corresponding sequence control. During the time in which the picture of the further programme II is reproduced on the picture tube screen, the storage contents can circulate continuously.

As a simplification, it is possible to show the same storage contents in both fields of a frame, thereby not using the higher resolution that would result from an interlaced picture. This is possible, because the resolution in the vertical direction still remains of the same order as the horizontal resolution. By this measure it is possible to reduce the number of required storage positions to one half.

From the consideration that the speed of movement of an article, such as a football, shown in programme II, does not need to be higher in the picture sector of the further programme II than in the programme I, it follows that the number of new pictures of the further programme II to be stored may be reduced in proportion to the scale of reduction. From this the advantage is achieved that the disturbance of programme I caused by the switching of the tuner necessary for the storing of the programme II elements will be considerably reduced.

The circuit of the storing and switching stage 11, moreover, is arranged in such a way that during each frame scan of the picture I, only n/m lines of the further programme II will be abstracted, in which n is the number of lines of the picture of the further programme II on the reduced scale, and m is the number of storage scans chosen for renewing the entire storage contents (the number m , for example, can be equal to unity).

Both programme (I and II) shall be capable of being selected at will from the whole range of stations and programmes available, so that, as a rule, both programmes are controlled by different master clocks. On account of this, however, the individual lines of the further programme II to be stored will be stored in arbitrary storage positions of the storage device, i.e. the beginning of the line and the end of the line are no longer in agreement with the beginning and the end of the corresponding storage line. This problem, however, must be overcome in order to achieve a display that can be understood and this can be achieved by enabling the information contained in the corresponding storage line to circulate until the line synchronizing pulse appears at a certain point, e.g. at the end of the storage line. Since the vertical synchronizing pulse of the reduced size picture is also not in phase with that of the picture of programme I, a corresponding adjustment is also necessary in this case. A simple picture plus search circuit, which may consist of a conventional pulse separating circuit with an integrating network, can be used to control the storing of each line to be stored into the corresponding storage lines, as soon as the vertical (picture) synchronizing pulse has been detected in a predetermined storage line.

As storage devices, it is advantageously possible to use storage devices resembling the known types of charge transfer circuits, for example, bucket-brigade circuits, or charge-coupled devices.

It is also possible to show the picture of the further programme II as a still which is taken at certain time intervals from the running programme, thus permitting the storage control to be simplified. Of course, in that case it will be necessary to do without some of the movement information contained in the further programme II but which, depending on the importance attached thereto and on the attention being paid by the viewer to the further programme II, might be of lesser importance.

Theoretically, of course, it is also possible to show, not only a further programme II, in the manner proposed by the invention, but, if so required, several additional programmes.

WHAT WE CLAIM IS:—

1. A broadcast television receiver in which a first broadcast programme and at least one further broadcast programme receivable on different frequencies of a broadcast television network can be shown simultaneously on the same screen of a picture reproduction device, including means in the receiver for receiving said programmes sequentially, and means for reproducing on reduced scale the picture corresponding to

the or a further programme on a portion of the screen of the said device on which the picture corresponding to the first programme is being reproduced and so as to replace that part of the picture of the first programme in the said portion.

2. A television receiver as claimed in claim 1 in which common apparatus is provided for the signals of the at least two programmes between an input tuner and the picture reproduction device.

3. A television receiver as claimed in claim 1 or 2 which includes a storage device for storing the picture content of a further programme to be reproduced, the picture content being stored with a reduction in the number of lines per frame compared with the number available and being read out for reproduction line by line, the lines being displayed in positions corresponding to replaced lines of the first programme.

4. A television receiver as claimed in claim 3 in which during storage in the said storage device of the picture content of a further programme the tuner is switched from the receiving frequency of the first programme to that of the further programme.

5. A television receiver as claimed in claim 4 in which during the time that a line of the further programme is being stored in the storage device, a signal is applied to the picture reproduction device which corresponds to the medium brightness of a preceding line of the first programme.

6. A television receiver as claimed in claim 4, adapted to reproduce colour television signals, in which during the time that a line of the further programme is being stored in the storage device, a signal is applied to the picture reproduction device which corresponds to the colour information of the preceding line.

7. A television receiver as claimed in claim 6, adapted to reproduce colour television signals according to the PAL-system, in which the colour information relating to the preceding line is obtained from the delay line in the PAL-colour television receiver.

8. A colour television receiver as claimed in claim 6 or claim 7 in which, during the time in which a line of the further programme is being stored in the storage device, a signal related to the stored brightness signal of a preceding line is applied to the picture reproduction device.

9. A television receiver as claimed in any one of the preceding claims in which the two fields constituting each frame of the further programme are identical.

10. A television receiver as claimed in any one of the preceding claims in which

the number of lines and the number of picture elements per line of the picture of the (or a) further programme are smaller than if this programme were being reproduced on an area of screen of the same size as the first programme.

11. A television receiver as claimed in any one of the preceding claims and operating according to the 625-line television standard, in which the picture corresponding to the (or a) further programme is reproduced in a raster consisting of 45 lines.

12. A television receiver as claimed in any one of the preceding claims in which the picture corresponding to the (or a) further programme has diagonals which are about 10 cm in length.

13. A television receiver as claimed in claim 3 or any one of claims 4 to 12 when dependent upon claim 3 in which a part only of the contents of the storage device is renewed during each scan of the picture of the (or a) further programme to be stored.

14. A television receiver as claimed in claim 3 or any one of claims 4 to 13 when dependent upon claim 3 in which the storage device contains a number of storage rows corresponding to the number of lines of the reproduced picture of the (or a) further programme, there being a number of storage positions in each line corresponding to the number of picture elements in the reproduced picture of the further programme.

15. A television receiver as claimed in claim 3 or any one of claims 4 to 14 when dependent upon claim 3 in which the lines of the picture to be stored are transferred serially to the rows of the storage device.

16. A television receiver as claimed in claim 3 or any one of claims 4 to 15 when dependent upon claim 3 in which the contents of the lines of the picture can be stored in the storage device in predetermined positions in accordance with received frame and line synchronizing pulses.

17. A television receiver as claimed in claim 3 or any one of claims 4 to 16 when dependent upon claim 3 in which the storage device includes delay lines operating on the charge transfer device principle.

18. A television receiver having a circuit arrangement substantially as described herein with reference to Fig. 2 of the accompanying drawings.

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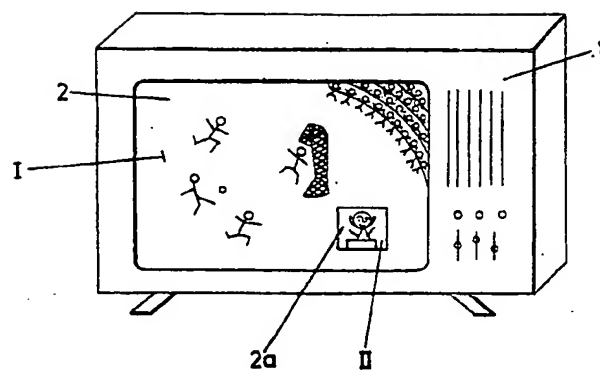


FIG. 1.

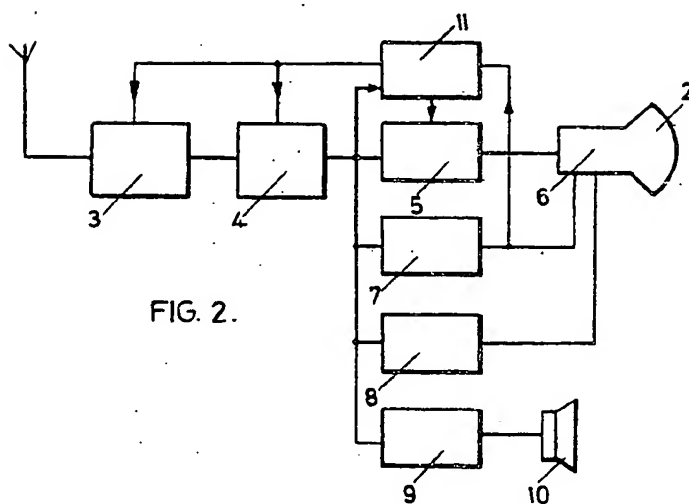


FIG. 2.

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